

## PATENT ABSTRACTS OF JAPAN

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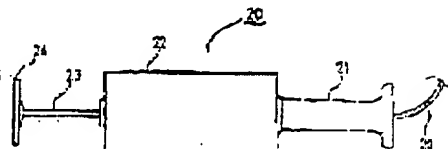
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### (54) ISCHEMIC CARDIOPATHY TREATMENT SYSTEM

#### (57)Abstract:

**PURPOSE:** To more develop means for vibration input from the outside and to put this means into clinical practicability by arranging an attachment section in such a manner that vibrations are inputted from the precordial mold Erb region and increasing a coronary blood flow rate by the vibrations inputted in the diastole by an electrocardiographic trigger.

**CONSTITUTION:** A portable type exciter 20 is composed of an actuator section 22 of a clamping section 21, a vibrating shaft 23 and the attachment section 24. An electric signal is sent by a cord 25 to the actuator section 22, by which the actuator section 22 is operated. The required vibrations are inputted from the attachment section 24 via the vibration shaft 23 into the patient's precordial mold Erb region. An operator is able to make input by holding the clamping section 21 with one hand and lightly pressing, for example, soft silicon rubber to the patient's precordial mold. The input of the vibrations at an arbitrary cardiac time phase is made possible by the electrocardiographic trigger and the arbitrary input with control by an external signal is possible in addition to sinusoidal waves and square waves of respective frequencies. The coronary blood flow rate is thus increased by applying the mechanical vibrations controlled in the cardiac time phase from above the chest wall.



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## CLAIMS

[Claim(s)]

[Claim 1] The actuator section in which it is the therapy system which the vibration from a pocket mold shaker is inputted [ system ] from a breast type, and increases the coronary flow in ischemic heart disease, and this shaker operates with an electrical signal with a bundle hand part, the oscillating shaft list linked to this -- the attachment section at the tip of an oscillating shaft -- having -- the attachment section -- a prothorax -- the ischemic-heart-disease therapy system characterized by being arranged so that an oscillating input may be carried out from a mold Erb area, and for vibration being inputted by the electrocardiogram trigger at diastole, and increasing a coronary flow.

[Claim 2] The ischemic-heart-disease therapy system characterized by passing, measuring a coronary blood flow rate by the esophagus pulse doppler in the system of claim 1, and controlling an oscillating input based on this measurement.

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JP,08-089549,A [DETAILED DESCRIPTION]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to an ischemic-heart-disease therapy system. This invention relates to the new ischemic-heart-disease therapy system which can increase a coronary flow simple in ischemic heart disease in more detail, without being accompanied by a patient's pain.

[0002]

[Description of the Prior Art] From the former, it is well known that cardiac insufficiency, such as an ischemic heart disease, hypertrophy \*\*\*\*\*, and an aortic insufficiency, occupies the ratio still high as a factor of a death due to sickness, and the early treatment approach of such cardiac insufficiency is being studied in the field of medicine and medical engineering.

[0003] To others, such as fibrosis of a myocardium, about the most numerous ischemic heart disease among the cause diseases which cause cardiac insufficiency by continuation of the cross-bridge activity in the left ventricle diastole in the heterogeneity and the ischemia section myocardium of contraction etc. [ section / the normal section and / ischemia ] A left ventricle escape failure is caused, such a left ventricle escape failure causes the effect of increase of the blood vessel external pressure to coronary perfusion, the inequality of an inside-and-outside myocardium blood flow, myocardium oxygen-demand increase, etc., and it has been shown clearly that vicious circle of worsening myocardial ischemia is formed.

X [0004] Although the ischemic-heart-disease therapy approach which is mainly concerned with pharmacotherapy had generally been performed to current in consideration of the myocardium condition of such ischemic heart disease, since there was a limitation in an improvement of the ischemia condition by pharmacotherapy, these and concomitant use were possible and it waited eagerly for the new ischemic-heart-disease therapy approach that action mechanisms differ. In such a situation, the attempt which inputs mechanical oscillation and considers the response of the muscle contraction force at that time about various muscles, such as skeletal muscle, a smooth muscle, and a myocardium, has attracted attention since the report of Huxley of the rapid expansion by skeletal muscle making cross-bridge association dissociate recently.

[0005] However, the fundamental research which investigated what kind of effect the muscle contraction force response to such mechanical oscillation would have when an input frequency and the input amplitude are changed using the extraction sample of each muscles is most, and there is almost no attempt which it was going to develop to the approach of using for the therapy of ischemic heart disease clinically using a mechanical oscillation input.

[0006] Then, paying attention to the technique of this oscillating input, the artificers of this invention examined the fundamental technique about the diagnostic therapy for cardiac insufficiency, and proposed that result. For example, it is the diagnostic therapeutic device for cardiac insufficiency as the result which was shown in drawing 1. The transmitter with which this equipment generates the sinusoidal signal of about 50Hz low frequency (1), The control apparatus which controls the output timing of the continuous ringing generated with the transmitter (1) (2), The power amplification which

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amplifies the output of the control apparatus (2) (3), The shaker which inputs mechanical oscillation into the heart with the output of the power amplification (3) (4), The sway sensor which detects the magnitude of the mechanical oscillation actually added to the left ventricle within an esophagus (7). For example, the sway sensor which attaches in the shaft of a shaker (4) and detects input mechanical oscillation (5), Ultrasonic BUROBU (6) which detects an aortic valve pattern, the oscillating controller which controls the output of a transmitter (1) so that the magnitude of the mechanical oscillation actually added to the left ventricle becomes fixed (8), It consists of the electrode (9) for taking an electrocardiogram, a data processor (10), a monitoring device (11), a blood-pressure-measurement machine (12), blood-pressure test equipment (13), etc.

[0007] However, when treating ischemic heart disease using such a diagnostic therapeutic device for cardiac insufficiency, the knowledge about the technical means in a clinical aspect was very scarce, and it was difficult for the actual condition for the policy for increasing the coronary flow which is a big problem not to be found out, but to treat ischemic heart disease in fact using such a conventional diagnostic therapeutic device for cardiac insufficiency for ischemic heart disease, without giving a patient pain by simpler actuation.

[0008] This invention is made in view of the situation as above, develops the means of the oscillating input from the outside more, and aims at offering a clinically utilizable new ischemic-heart-disease therapy system.

[0009]

[Means for Solving the Problem] This invention is a therapy system which the vibration from a pocket mold shaker is inputted [ system ] from a breast type, and increases the coronary flow in ischemic heart disease as what solves the above-mentioned technical problem. This pocket mold shaker equips with the attachment section at the tip of an oscillating shaft the actuator section which operates with an electrical signal with a bundle hand part, and the oscillating shaft list linked to this. The attachment section a prothorax -- it is arranged so that an oscillating input may be carried out from a mold Erb area, and the ischemic-heart-disease therapy system characterized by being inputted by the electrocardio section trigger at diastole and increasing a coronary flow is offered.

[0010] Moreover, in the above-mentioned system, it passes through this invention, it measures a \*\*\*\* coronary blood flow rate to an esophagus pulse doppler, and also requires controlling an oscillating input based on this measurement also as that one mode.

[0011]

[Function] A left ventricle escape failure is seen in ischemic heart disease, it is the factor in which the left ventricle escape failure itself reduces a myocardium perfusion rate, that is, the ischemia and a left ventricle escape failure form the vicious circle of worsening the ischemia mutually, in ischemic heart disease. Then, the artificer of this invention inputted mechanical oscillation from an ischemic-heart-disease patient's breast-wall top, or the epicardium side, considered theoretically and experimentally the relation between the ventricle response at that time, and a coronary blood flow rate, and completed this invention for the purpose of putting in practical use clinically.

[0012] This invention examines the improvement and coronary blood flow enhancement effect of left ventricle extension by the 1 left-ventricle diastole mechanical oscillation inputting method. Namely, vessel qualitative shifts, such as fibrosis, Functional change called continuation of cross-bridge activity is distinguished from the difference of the response at the time of these mechanical oscillation input. 2) It is based on the examination of clinical application of this mechanical oscillation inputting method to 3 ischemic-heart-disease patients from knowledge that cross-bridge activity continuation and fibrosis have important semantics on a left ventricle escape failure in ischemic heart disease.

[0013] Although based on what was fundamentally shown in drawing 1 as the structure of a system, the pocket mold shaker is used as an indispensable means for clinical application. Even if this pocket mold shaker corresponds to the individual difference by the patient sharply at any time and it is in a therapy process, it has the description that actuation is also easy, without that interruption and modification being easy and moreover giving a patient pain along with a diagnosis of a medical practitioner.

Therefore, also not only in the use in the time of the hospitalization in a medical-examination engine,

and an outpatient department but a house or a station etc., it is usable.

[0014] this pocket mold shaker -- the above-mentioned passage -- a bundle hand part, the actuator section, and an oscillating shaft and the attachment section -- having -- this attachment section -- a pad etc. -- minding -- a patient's prothorax -- it is arranged so that an oscillating input may be carried out from a mold Erb area. And increase of a coronary flow is used with this pocket mold shaker. In this case, in order to secure the mobility on clinical [ to ischemic heart disease ], it is desirable to measure a coronary blood flow rate by the path esophagus pulse doppler, and to control an oscillating input based on this measurement.

[0015] Hereafter, an example is shown and this invention is explained in more detail.

[0016]

[Example] Drawing 2 illustrates the pocket mold shaker (20) of the system of this invention. The pocket mold shaker (20) is constituted from this example by a bundle hand part (21), the actuator section (22), and the oscillating shaft (23) and the attachment section (24) of a cylindrical shape. In code (25), an electrical signal is sent to the actuator section (22), and the actuator section (22) operates in it. a necessary vibration -- an oscillating shaft (23) -- minding -- the attachment section (24) -- a patient's prothorax -- it is inputted from a mold Erb area. Vibration will be generated in the cross direction of an oscillating shaft (23).

[0017] a bundle hand part (21) -- one hand -- having -- for example, elasticity silicone rubber -- a patient's prothorax -- it can hit to a mold lightly and can input into it. The input of vibration [ by the electrocardiogram trigger ] by the cardiac tense of arbitration is possible, and the wave-like input of arbitration is also possible at control according to an external signal besides the sine wave of each frequency, and a square wave. The above pocket mold shaker was performed, it passed through increase of a coronary flow from the breast wall, and the coronary blood flow rate evaluation using the esophagus pulse-doppler method considered the mechanical oscillation which controlled the cardiac tense.

[0018] Coronary artery nature heart disease patient trinomial (59.7 years old of average age, a male binary name, one support) was made into the test subject. All these patients have the past of pectoralgia and accepted a constriction in the left previous line branch by coronarography further. It examined, even if it took the post of nine adults (inside 46.4 years old of average age, seven men, a female binary name) who understand that it is normal by the medical checkup as these patients' object on the other hand. namely, these healthy test subjects -- hypertension, a heart disease, diabetes mellitus, and hyperlipidemia -- neither was accepted but the biochemistry laboratory report was also still normaler.

[0019] As a pretreatment, the inspection approach carried out intramuscular injection of the diazepam 5mg, and anesthetized the pharynx by xylocaine bis-dregs. As a parameter, blood pressure was measured with the right upper arm at any time by the esophagus pulse-doppler method by passing, having measured the coronary blood flow rate and acting to coincidence as the monitor of an electrocardiogram, a phonocardiogram, and the spirogram by the NEZARU thermistor.

[0020] Using the pocket mold shaker, sinusoidal mechanical oscillation with an amplitude [ of 2mm ] and a frequency of 50Hz was controlled by the electrocardiogram trigger at left ventricle diastole, and was inputted from a test subject's anterior chest wall Erb area by it. About use of this portable shaker, a left main trunk and the front ramus descendens were used as the test section, it passed at the time before excitation of excitation, and the coronary blood flow rate was measured and evaluated by the same respiratory tense by the esophagus pulse-doppler method.

[0021] Drawing 3 (A) and (B) show depiction of the left coronary artery by the transesophageal-echocardiography method. This drawing 3 (A) shows a B mode image, and drawing 3 (B) shows the pulse-doppler image of the left chief editor section. Reference of drawing 3 (A) describes clearly the left coronary artery means section LMT which branches from the main artery Ao, and the left anterior descendance LAD from the main artery Ao itself in a B mode image.

[0022] Moreover, drawing 3 (B) shows a coronary blood flow rate wave, the spirogram, the phonocardiogram, and the electrocardiogram from the top. Drawing 4 (A) and (B) show the M-mode image of a posterior wall of left ventricle and a front wall, drawing 4 (A) is before excitation and drawing 4 (B) is the wall motion at the time of excitation. Although a concavo-convex intense curve is

escape failure improves and two ischemic heart disease, and three ischemic heart disease that correction of the heterogeneity of contraction and an improvement of a coronary blood flow speak to coincidence, and effectiveness maintains after a mechanical oscillation termination for a while, and 4 -- it found out that left ventricle expandability could be also clinically improved by the mechanical oscillation input from on a breast wall etc.

X[0029] It suggested that the mechanical oscillation input by the pocket mold shaker showed clinically possibility of increasing a left ventricle diastole coronary flow, in ischemic heart disease, combined also with possibility of making attainment to the ischemia field of (drugs) easy, and could serve as a very effective means from these results on an ischemic disease patient's therapy. On the other hand in the conventional system illustrated to drawing 1, pain might be given to the patient, and it was not necessarily thoroughgoing as a therapy system.

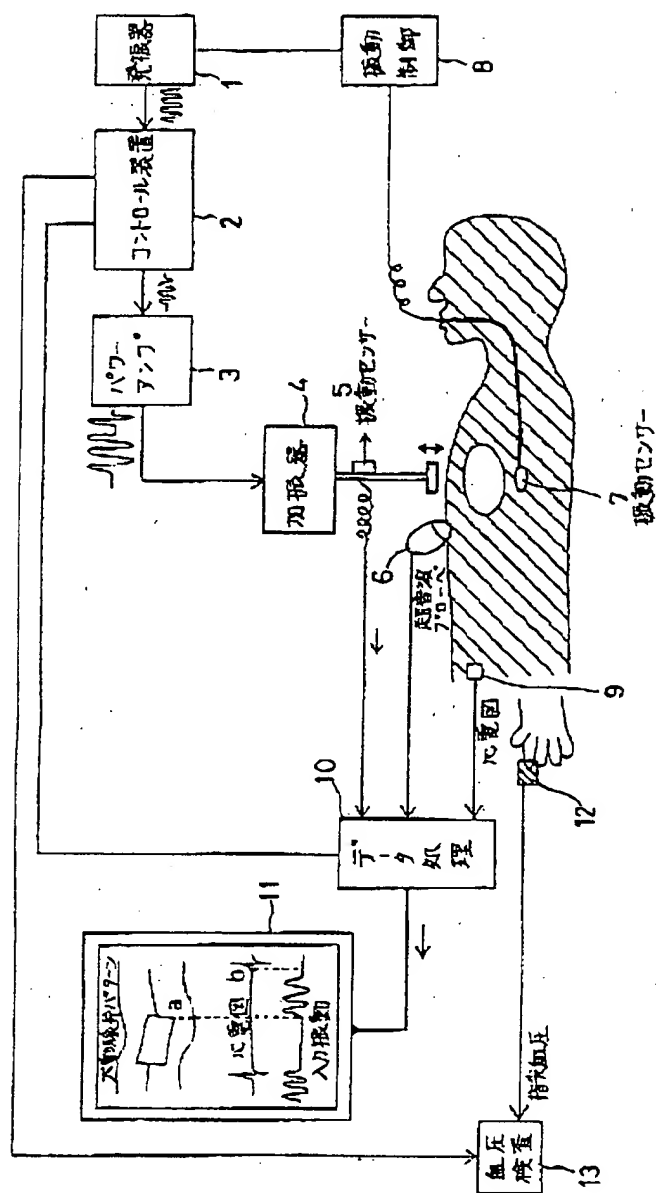
[0030]

[Effect of the Invention] When limiting to 1 left-ventricle diastole and inputting mechanical oscillation by this invention as explained in detail above In that the time of the improvement effect of a left ventricle escape failure when the degree of a left ventricle escape failure is severer is [ in / a ventriclus-sinister left ventricle escape failure is improved, and / two ischemic heart disease ] more remarkable, and three ischemic heart disease Correction of the heterogeneity of contraction and an improvement of a coronary blood flow were discovered to coincidence, and it was checked that after a mechanical oscillation termination maintains effectiveness for a while.

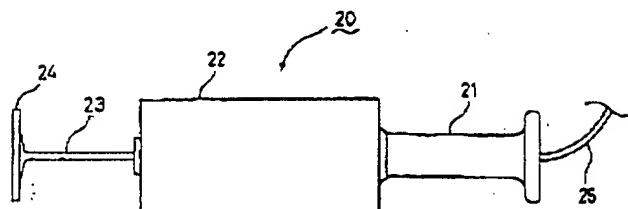
[0031] This invention by the oscillating input serves as a very effective means as a system which treats an ischemic disease from these things in ischemic heart disease clinically.

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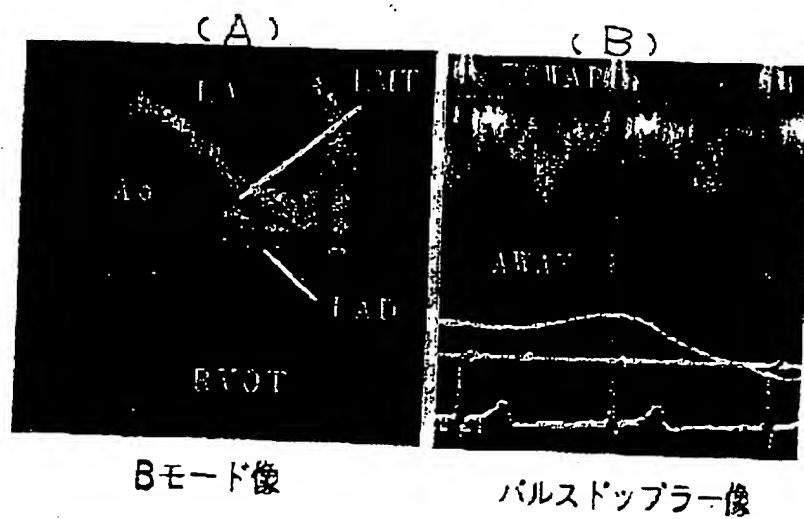


Drawing selection drawing 2

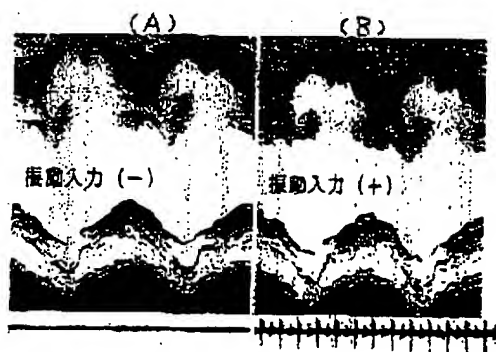




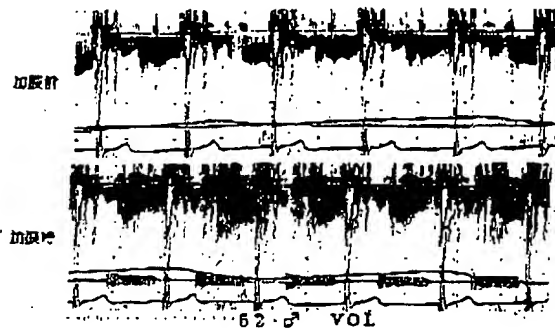
Drawing selection drawing 3



Drawing selection drawing 4



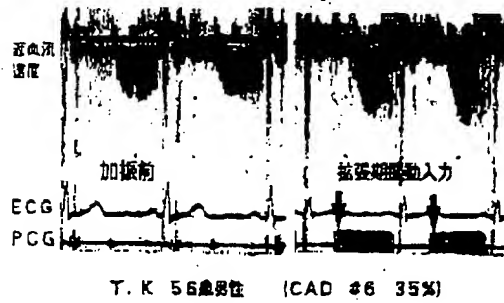
Drawing selection drawing 5



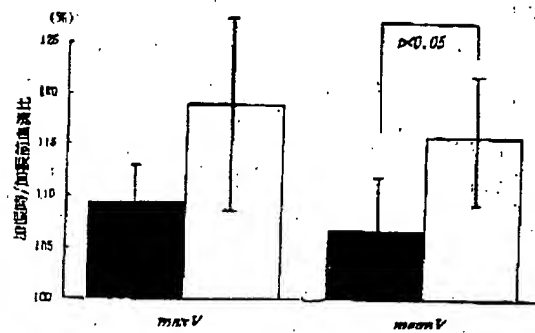
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Drawing selection drawing 6



Drawing selection drawing 8



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